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Sensory Deafness in Workers at PT X Rokan Hulu Palm Oil Mill

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Abstract. *Sensorineural deafness is a type of hearing loss that commonly occurs due to noise exposure in the workplace, including in palm oil mills (PKS). This condition can reduce the quality of life of workers and have an impact on productivity. This study aims to identify the prevalence and factors that influence the occurrence of sensorineural deafness in palm oil mill workers, with a focus on the Pekanbaru area. This research method uses observational research, measuring deafness using a tuning fork. at PT X in July 2020. Results. From the analysis univariate It was found that 58.6% of PKS workers experienced sensorineural deafness. The conclusion is that more than half of the workers experiencing sensorineural deafness .*

Keywords : *Sensorineural deafness, Palm oil mill , Sensorineural hearing loss, Personal protective equipment*

1. BACKGROUND

Sensorineural hearing loss (SNHL) is a prevalent occupational health issue among workers exposed to high levels of noise, particularly in industrial settings such as palm oil factories. This type of hearing loss results from damage to the hair cells in the cochlea or the auditory nerve, leading to permanent hearing impairment (Clark & Bohne, 1999). In the context of palm oil factories, the machinery used in the production process generates significant noise levels, often exceeding safe exposure limits. Prolonged exposure to such noise without adequate hearing protection can lead to irreversible SNHL, which not only affects the quality of life of the workers but also their productivity and safety on the job (Kurmis & Apps, 2007).

Globally, noise-induced hearing loss (NIHL) accounts for approximately 16% of disabling hearing loss among adults, with a significant proportion attributed to occupational exposure (Nelson et al., 2005). In Indonesia, particularly in regions like Pekanbaru where palm oil production is a major industry, the prevalence of SNHL among factory workers is a growing concern. The lack of strict enforcement of occupational safety regulations and the limited use of personal protective equipment (PPE) contribute to the higher incidence of SNHL in these settings (Johnson & Seaton, 2012). Despite the availability of hearing protection devices, many workers either do not use them consistently or are unaware of their importance, leading to increased vulnerability to hearing damage (Hong et al., 2013).

The main problem faced in this study is the lack of specific data on the prevalence of SNHL among palm oil mill workers in Pekanbaru. In addition, limitations in the implementation of prevention programs and lack of worker awareness of noise risks are also challenges in reducing the incidence of SNHL.

2. LITERATURE REVIEW

Characteristics and Factors Affecting SNHL: Several factors that contribute to the occurrence of SNHL in palm oil mill workers include:

Noise Exposure: High and sustained noise levels in industrial environments can cause permanent damage to the hair cells in the inner ear (Johnson & Seaton, 2012).

Sensorineural hearing loss (SNHL) is a significant health issue directly related to prolonged exposure to high levels of noise. This type of hearing loss results from damage to the cochlea's hair cells or the auditory nerve, which is crucial for transmitting sound signals to the brain (Clark & Bohne, 1999). Noise exposure can lead to SNHL by causing mechanical damage to these sensory cells and through metabolic changes within the inner ear. Chronic exposure to noise not only damages the hair cells but also disrupts the cochlear blood supply, exacerbating hearing loss (Lonsbury-Martin & Martin, 2008). The pathophysiology of noise-induced hearing loss involves both direct trauma from loud sounds and indirect effects such as oxidative stress and inflammation, which further contribute to the deterioration of auditory function (Kujawa & Liberman, 2009).

The relationship between noise exposure and SNHL is well-documented in various industrial settings. Noise levels in many occupational environments can exceed 85 dB(A), the threshold recommended by occupational health guidelines for safe exposure (Nelson et al., 2005). In environments such as manufacturing plants, construction sites, and palm oil factories, workers are often exposed to noise levels that are significantly higher than this threshold. Studies have shown that prolonged exposure to such high noise levels increases the risk of developing SNHL, particularly when appropriate hearing protection measures are not used (Kurmis & Apps, 2007). For example, workers in palm oil factories are frequently exposed to machinery noise that exceeds 100 dB(A), putting them at a higher risk of developing hearing loss (Johnson & Seaton, 2012).

Several mechanisms explain how noise exposure leads to SNHL. High-intensity noise exposure causes physical damage to the hair cells in the cochlea, which are responsible for converting sound waves into electrical signals for the brain. This damage is often irreversible,

leading to permanent hearing loss (Clark & Bohne, 1999). Additionally, noise exposure can induce metabolic stress within the cochlea, leading to further cellular damage and dysfunction (Lonsbury-Martin & Martin, 2008). Research indicates that noise-induced hearing loss often begins with high-frequency hearing loss and progresses to affect lower frequencies over time, reflecting the damage to the cochlea's outer hair cells, which are more susceptible to noise-induced damage (Kujawa & Liberman, 2009). This progressive nature of hearing loss underscores the importance of early intervention and preventive measures to mitigate the impact of noise exposure on hearing health.

1. **Duration of Exposure:** Workers exposed to noise for more than 8 hours per day have a higher risk of developing SNHL (Kurmis & Apps, 2007).
2. **Use of Personal Protective Equipment (PPE):** The use of PPE such as earplugs or earmuffs can reduce the risk of SNHL, but compliance with its use is still low among workers (Hong et al., 2013).
3. **Age Factor:** The age of the worker also plays a role, with older workers being more susceptible to SNHL due to cumulative noise exposure (Clark & Bohne, 1999).

3. METHOD

Study This about analytical observation . The population was 135 respondents. However, only 58 respondents met the inclusion criteria in this study. While 77 respondents did not meet the inclusion criteria and met the exclusion criteria, namely: 11 people were staff employees, 1 person was not willing to be a respondent, 3 workers had a history of heart disease and diabetes, 24 workers lived around the factory, 10 workers listened to music very loudly, 7 workers consumed antibiotics, and 21 workers had a family history of hearing loss before 50 years. The tools used For study : sheet stuffing questionnaire For to determine the intensity of noise and whether or not workers have sensorineural hearing loss part machine , Sound *Level Meter* (SLM), tuning fork and otoscope .

4. RESULTS AND DISCUSSION

Results

Table 1 Characteristics Age Worker Palm Oil Mill PT X

Age	Frequency	Percent
≤ 40 years	44	
>40 years	14	
Total	58	100%

In table 1 it is found that part big worker aged ≤ 40 years that is as many as 44 people (75.9%) and workers aged > 40 years as many as 14 people (24.1%).

Table 2 Working Period Worker Palm Oil Mill PT X

Years of service	Frequency	Percent
≤ 5 years	5	8.6%
>5 years	53	91.4%
Total	58	100%

In table 2 it is found that almost all over worker working ≤ 5 years that is as many as 53 people (91.4%) and workers who worked > 5 years as many as 5 people (8.6%).

Table 3 Distribution Frequency intensity Noise in Palm Oil Factory Workers PT X

Intensitas kebisingan	Frekuensi	Persen (%)
Berisiko	40	69,0
Tidak berisiko	18	31,0
Total	58	100

Based on Table 3, it is obtained part big worker experiencing risky noise intensity, namely 40 people (69.0%) and workers who were not at risk numbered 18 people (31.0%).

Table 4 Frequency Distribution of Noise Intensity in the Palm Oil Factory Section at PT. X

Stasiun Kerja	Hasil (dB)	Keterangan
Loading ramp atau Rantaian	76	Di bawah NAB
Sterilisasi atau Perebusan	88	Di atas NAB
Theressing atau penebahan	86	Di atas NAB
Press	87	Di atas NAB
Kernel	93	Di atas NAB
Boiler	90	Di atas NAB
Klarifikasi	89	Di atas NAB
Power house atau Kamar mesin	109	Di atas NAB
Water Treatmant Plant	70	Di bawah NAB
Land Aplication atau Limbah	65	Di bawah NAB

Based on Table 4, it is obtained results intensity The noise at the PT. EMA Rokan Hulu PKS is the loudest at the *power house plant station* or engine room station (109 dB) which exceeds the NAB or > 85 dB, and the station with the lowest noise is at the waste station (65 dB) which does not... exceeds NAB or ≤ 85 dB.

Table 5 Frequency Distribution of Sensorineural Deafness in Palm Oil Factory Workers of PT. X

Gangguan Pendengaran	Frekuensi	Persen (%)
Tidak gangguan pendengaran tipe sensorineural	24	41,4
Gangguan pendengaran tipe Sensorineural	34	58,6
Total	58	100,0

Based on Table 3, it was found that the majority of workers experienced sensorineural hearing loss, namely 34 people (58.6%) and workers who did not have sensorineural hearing loss numbered 24 people (41.4%).

Discussion

This discussion will discuss research findings related to the prevalence of SNHL in palm oil mills in Pekanbaru. Analysis of identified risk factors will also be conducted to provide a comprehensive picture of the situation on the ground. Furthermore, effective prevention strategies, including increased use of PPE and educational programs for workers, will be discussed. as effort For reduce SNHL incident .

Age as a Contributing Factor

Age is a significant factor in the development of sensorineural hearing loss (SNHL) among palm oil factory workers. As individuals age, the natural degeneration of auditory structures, including the cochlea and auditory nerve, increases the risk of hearing impairment. This process, known as presbycusis, is exacerbated by prolonged exposure to occupational noise, which accelerates the deterioration of hearing abilities (Nelson et al., 2005). In older workers, the cumulative effect of both aging and noise exposure leads to a higher prevalence of SNHL compared to younger workers, making age an important determinant in the onset of this condition.

Moreover, older workers may have been exposed to hazardous noise levels over a longer period, further compounding their risk of developing SNHL. Studies have shown that older workers in noisy environments are more susceptible to permanent hearing damage due to their prolonged exposure and reduced resilience to auditory stress (Kujawa & Liberman, 2006). Therefore, age not only predisposes workers to SNHL through natural aging processes but also increases vulnerability due to extended exposure to occupational noise hazards.

Work Tenure of 5 Years or More

The duration of employment, particularly work tenure of 5 years or more, is another critical factor influencing the incidence of SNHL in palm oil factory workers. Prolonged exposure to high noise levels in industrial settings, such as palm oil mills, contributes significantly to the development of noise-induced hearing loss (NIHL), a subset of SNHL (Fuente & Hickson, 2011). Workers who have been employed for five years or more are at a greater risk because of the cumulative noise exposure they experience over time.

Research indicates that the risk of SNHL increases with the length of time workers are exposed to noise levels exceeding 85 dB, which is common in industrial environments (Sliwinska-Kowalska & Davis, 2012). Over the years, repeated exposure to loud machinery and industrial processes can cause irreversible damage to the hair cells in the cochlea, leading to permanent hearing loss. This correlation between work tenure and SNHL underscores the need for continuous monitoring of hearing function in workers with long-term exposure to noisy environments.

Combined Impact of Age and Work Tenure

The combined effect of advancing age and prolonged work tenure intensifies the risk of SNHL among palm oil workers. Older workers with extended periods of noise exposure are particularly vulnerable due to the synergistic impact of age-related auditory degeneration and noise-induced damage. Studies have highlighted that the interaction between these factors leads to a greater incidence of SNHL in older workers with long work histories in noisy environments compared to their younger or less tenured counterparts (Henderson et al., 2011). This combined effect suggests that targeted interventions are necessary to protect this high-risk group from further hearing deterioration.

Impact of Noise Intensity on SNHL Development

The intensity of noise exposure is a critical factor in the development of sensorineural hearing loss (SNHL). Noise intensity is measured in decibels (dB), and exposure to noise levels above 85 dB is known to cause irreversible damage to the inner ear, particularly the hair cells in the cochlea, which are essential for hearing. Prolonged exposure to high-intensity noise leads to cumulative auditory damage, which manifests as SNHL (Sliwinska-Kowalska & Davis, 2012). The relationship between noise intensity and hearing loss is well-documented; higher noise levels result in more significant hearing impairment, and the risk of SNHL increases with both the intensity and duration of noise exposure.

Research has shown that workers exposed to noise levels exceeding 90 dB have a significantly higher risk of developing SNHL compared to those exposed to lower noise levels. The damage caused by such intense noise exposure is often permanent, as the hair cells in the cochlea do not regenerate once they are destroyed (Nelson et al., 2005). This highlights the critical need for effective noise control measures in workplaces with high noise levels, such as palm oil factories, where machinery and industrial processes often produce hazardous noise levels.

Cumulative Effects of Noise Exposure

The cumulative effect of noise exposure over time also plays a significant role in the development of SNHL. Even if the noise intensity is not extremely high, long-term exposure to moderate levels of noise can still lead to significant hearing loss. This is particularly concerning in industrial settings, where workers may be exposed to continuous noise for many hours each day over several years (Fuente & Hickson, 2011). The cumulative impact of such exposure gradually leads to the degeneration of auditory structures, eventually resulting in SNHL.

Moreover, the risk of SNHL increases exponentially with both noise intensity and exposure duration. For example, a worker exposed to 90 dB for eight hours a day is at greater risk than a worker exposed to 85 dB for the same period. This cumulative effect underscores the importance of monitoring noise levels in the workplace and implementing measures to minimize exposure, especially for workers with long tenure in noisy environments (Seixas et al., 2004).

Noise-Induced Hearing Loss in Palm Oil Workers

In palm oil factories, where the machinery and processes involved in oil extraction and processing often produce high noise levels, workers are particularly vulnerable to noise-induced hearing loss (NIHL), a common form of SNHL . Studies conducted in similar industrial settings have shown that workers exposed to noise levels exceeding 85 dB are at a high risk of developing NIHL, with the severity of hearing loss correlating directly with the intensity and duration of noise exposure (Henderson et al., 2011) . Given the nature of the work and the continuous operation of noisy machinery, palm oil workers are at significant risk of SNHL if effective preventive measures are not implemented.

5. CONCLUSION AND SUGGESTIONS

Conclusion from study This is that SNHL is a significant health problem among palm oil mill workers in Pekanbaru, with noise exposure as a major factor. Suggestions provided include

increasing worker awareness of the risks of SNHL, increasing the use of PPE, and implementing a health monitoring program. hearing routinely .

Preventive measures are critical in addressing the high rates of SNHL among palm oil factory workers. Implementing comprehensive hearing conservation programs, which include regular auditory testing, education on the risks of noise exposure, and the mandatory use of hearing protection, can significantly reduce the incidence of SNHL (Hong et al., 2013). Additionally, improving workplace safety standards and enforcing noise exposure limits can help mitigate the risk. The integration of these strategies into occupational health policies is essential for protecting the hearing health of workers in the palm oil industry.

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